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*FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR)*, *OAPI* patent (*BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG*)

- of inventorship (Rule 4.17(iv)) for US only

**Published:**

- with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Improved spectacles

Technical field

The present invention relates to improved spectacles of the type including the characteristics specified in the preamble to main Claim 1.

5 Technological background

The invention relates, particularly but not exclusively, to the field of rimless spectacles in which accessories of various shapes are fixed directly to the spectacle lens. The term "accessory" is intended to include herein, for example, the shoulders for the articulation of the arms, the nasal-support bridge, or a front  
10 crosspiece which extends between the arms and can support the lenses.

In known spectacles, the lens is arranged to be fixed to the accessory by the insertion and locking of a pin-like appendage, projecting from the accessory, in a through-hole formed in the lens, after a bush-like element has been housed in the hole and arranged so as to be interposed between the pin and the lens upon  
15 completion of the fitting. The interposition of the bush-like element which, typically, is made of plastics material, achieves an adequate and firm coupling as well as a greater and more uniform distribution of the clamping stresses between the mutually coupled surfaces of the lens and of the pin, particularly with materials, such as those of the lens and of the frame, which have different  
20 mechanical characteristics.

Description of the invention

The main object of the invention is to improve the mutual coupling between lenses and frames of the above-mentioned style, particularly in terms of greater ease of insertion of the pin-like appendage in the bush-like element of the frame.

25 Another object is to provide spectacles which are designed structurally and functionally to permit a greater degree of compensation for the tolerances in the coupling between the pin-like appendage of the accessory and the corresponding hole in the lens, particularly tolerances in their coaxial arrangement.

Yet another object is that of achieving an improved distribution of the  
30 clamping stresses between the mutually coupled surfaces of the lens and of the accessory, particularly so as to prevent the creation of critical tension states in the lens.

These objects and others which will become clearer from the following description are achieved by spectacles having the characteristics defined in the appended claims.

Brief description of the drawings

- 5           The characteristics and the advantages of the invention will become clearer from the following detailed description of a preferred embodiment, described by way of non-limiting example with reference to the appended drawings, in which:
- Figure 1 is a partially-sectioned, plan view of spectacles formed in accordance with the present invention,
  - 10 - Figure 2 is a partially-sectioned side elevational view of a detail of the spectacles of Figure 1, with parts separated,
  - Figures 3 and 4 are axial sections through a detail of the spectacles of the preceding drawings, in respective variants of the invention,
  - Figure 5 is a partial side elevational view of a further detail in a variant of the
  - 15 spectacles according to the invention,
  - Figures 6 and 7 are views of the detail of Figure 2 with parts separated and in the assembled condition, respectively,
  - Figures 8, 9 and 10, 11 are views corresponding to Figures 6 and 7, respectively, of the detail of Figure 2, in different geometrical assembly conditions.

20 Preferred embodiment of the invention

With reference initially to Figure 1, reference numeral 1 indicates generally a pair of spectacles of which a lens 2, an arm 3, and an opposed bridge 4 are shown partially, but it will be appreciated that the spectacles comprise a further lens and a further arm which are identical but disposed in reflectively symmetrical

25 positions.

Only the end portion 5 of the arm 3 closest to the lens 2 is shown, but it will be appreciated that the intermediate portion and the opposite end are formed with a conventional configuration. In the region of the end portion 5, the arm 3 is articulated to the lens 2 by means of a hinge element 6, also known by the term

30 "shoulder" in the specific technical field, a hinge pin, and an eye formed at the free end of the portion 5. Figure 1 shows only the half of the bridge 4 which is fixed to the lens 2, but it will be appreciated that the bridge is reflectively symmetrical with respect to a plane defined by the axis X of Figure 1. The bridge comprises a

portion 7 for connection to the lenses and a pair of respective and opposed portions 7a (only one of which is shown in the drawing) carrying respective pads 8 for bearing on the nose.

For convenience of explanation, the shoulder 6 and the bridge 4 of the  
5 spectacles will also be referred to in general below by the term "accessory", the present invention relating to the common system for locking these accessories directly onto the spectacle lens, which system is typically used in rimless spectacles.

The term accessory is also intended to include any front crosspiece  
10 structure which extends at the front between the arms and is intended to support the lenses by the above-mentioned locking system, described in detail below.

In particular, the system for connecting the shoulder 6 to the lens 2 is described but it will be appreciated that an identical system distinguishes the connection of any of the above-mentioned accessories. In this connection,  
15 analogous details of these systems are indicated by the same reference numerals.

For the above-mentioned connection, the lens 2 has a through-hole 9 with a substantially cylindrical internal surface 9a extending axially through the thickness S of the lens.

20 The shoulder 6 in turn comprises a portion 10 having a surface 10a which is intended to abut the corresponding lens surface and from which a pin-like appendage 11 projects for insertion in the hole 9 in the lens.

The pin-like appendage 11 is inserted in the hole 9 after a bush-like element 12, perforated axially to define a through-hole 12a for receiving the pin-  
25 like appendage, has been inserted in the hole. The bush-like element 12 is thus interposed between the surface 9a of the hole 9 and a surface 11a defining the external lateral surface of the pin-like appendage 11.

According to a principal characteristic of the invention, in the bush-like element 12, which has opposed axial ends 13, 14, the through-hole 12a has a  
30 conical shape the taper of which is defined by corresponding generatrices that are inclined to the axis of the hole, indicated Y in the drawings. In greater detail, the generatrices of the hole 12a have a preselected inclination to the generatrices of the cylindrical surface 11a of the pin 11, and the selected degree of taper is such

that a region of interference between the hole 12a and the pin 11 is defined along at least a portion of the hole 12a, the axial extent of which is indicated 15.

With reference to Figure 2, the above-mentioned taper is uniform throughout the axial extent of the hole 12a, with a maximum diameter of the hole  
5 in the region of the end 13 through which the pin-like appendage 11 is inserted. Moreover, the above-mentioned diameter is selected so as to be greater than the diameter of the cylindrical surface of the pin so that the pin is inserted in the bush-like element with appreciable initial radial clearance for facilitating the fitting of the pin into the hole.

10 Moreover, most of the portion 15 in which interference takes place between the hole 12a and the pin 11 is arranged to extend axially beyond the bush portion which is engaged in the hole 9 in the lens, as shown in Figure 7. The expansion of the bush as a result of the interference coupling with the pin thus takes place outside the thickness S of the lens, thus avoiding the creation of tension states in  
15 the lens as a result of this expansion.

In the spectacles 1, pressure coupling means are provided between the pin-line appendage 11 and the bush-like element 12. These means comprise a plurality of annular projections 16 projecting from the cylindrical surface 11a of the pin-like appendage 11 for facilitating pressure locking by friction in the above-  
20 mentioned interference coupling. Alternatively, these projections 16 may have a spiral shape as shown in the variant illustrated in Figure 5. As a further alternative, the pin-like appendage 11 may comprise a threaded portion screwed into the bush by deformation of the bush in the interference region.

In a further variant, not shown, the projections 16 may adopt a  
25 configuration with more or less accentuated knurling for improving the friction in the pressure locking between the mutually coupled surfaces.

As an alternative to pressure coupling, a snap-coupling system may be provided between the pin-like appendage and the bush.

Figure 3 shows a first variant of the bush-like element 12 which differs from  
30 that of the previous embodiment mainly in that the hole 12a has a first portion and a second portion, indicated 17 and 18 respectively, which are coaxial and form axial continuations of one another, the first portion 17, which extends from the end

14, being conical, whereas the second portion is cylindrical. In this variant, the interference region coincides substantially with the cylindrical portion 18.

Figure 4 shows a second variant of the bush-like element which differs from the above-mentioned variant in that, instead of being cylindrical, the second  
5 portion is also conical with a different taper from that selected for the first portion 17. In this variant also, the interference region between the pin-like appendage and the bush substantially coincides with the second conical portion 18.

To facilitate the disengagement of the pin-like appendage 11 from the bush-like element 12, the latter advantageously has a head 19 extending in the  
10 region of the end 13 and formed as an enlargement of the cylindrical wall of the bush by means of a shoulder 20 for abutting the corresponding lens surface 2. The head 19 preferably has a polygonal, for example hexagonal, peripheral profile so as to form operating means for the disengagement of the bush from the pin-like  
appendage (for example by unscrewing). The head 19 may also have an upper  
15 surface 19a with a curved profile, for example, in the form of a spherical cap (Figure 2).

Finally, it should be noted that the conical hole 12a in the bush 12 compensates for any tolerances or deviation from the coaxial arrangement of the pin and the hole or any misalignments between the accessory and the pin-like  
20 appendage projecting therefrom in the coupling with the pin-like appendage 11. Figure 8 shows a typical coupling between a lens and an accessory in which there is a deviation from the coaxial arrangement of the hole 9 in the lens and the pin 11, but this can easily be compensated for by virtue of the conical shape of the hole 12a. The assembled condition is shown in Figure 9.

25 Figure 10 shows a situation in which there is a deviation in the perpendicularity between the accessory and the pin-like appendage. The presence of the conical hole 12a in the bush can compensate for the deviation, ensuring the correct relative positioning between the lens and the accessory, as shown in the assembled condition in Figure 11.

30 The invention thus achieves the objects proposed, affording many advantages over known solutions.

A first advantage is that the spectacles according to the invention improve the mutual coupling of the accessory and the lens, facilitating the insertion of pin-like appendages in the corresponding bushes provided in the lenses.

Another advantage is that of improved compensation for the coupling  
5 tolerances that are provided for in the processing of the spectacle components, particularly tolerances in the coaxial arrangement of the pin-like appendages and the corresponding holes in the lenses, as well of geometrical misalignments in the accessories.

Yet another advantage is that the spectacles according to the invention  
10 achieve an improved distribution of the clamping stresses between the mutually coupled surfaces of the lens and of the corresponding accessory which, in particular, can prevent or oppose the creation of critical tension states in the lens.



## Claims

1. Spectacles comprising at least one lens (2) provided with at least a first hole (9) for the locking of an accessory (4; 6) such as a shoulder for the articulation of an arm (3) of the spectacles, a nasal-support bridge, or a front crosspiece connecting the arms, the spectacles comprising at least one bush-like element (12) axially perforated with a respective second hole (12a), the accessory comprising a pin-like appendage (11) which can be inserted in the hole (12a) in the bush-like element (12) before the bush-like element (12) is inserted in the hole in the lens, so that the bush-like element (12) is interposed between an internal surface (9a) of the hole in the lens (2) and a corresponding external surface (11a) of the pin-like appendage (11), characterized in that the hole (12a) in the bush has, for at least a first portion (17) of its axial extent, generatrices having a preselected inclination to the generatrices of the pin-like appendage (11) so that a region (15) of interference between the hole (12a) in the bush (12) and the pin-like appendage (11) is defined along at least part of the said portion (17).

2. Spectacles according to Claim 2 in which the first portion (17) of the hole in the bush (12) is conical.

3. Spectacles according to Claim 1 or Claim 2 in which the second hole (12a) extends axially through the bush (12).

4. Spectacles according to Claim 3 in which the second hole (12a) has the same preselected taper throughout its axial extent.

5. Spectacles according to one or more of the preceding claims, in which the interference region extends in the hole (12a) of the bush-like element (12) axially beyond the bush portion which is engaged in the hole (9) in the lens.

6. Spectacles according to Claim 5 in which the interference region extends, in the bush-like element (12), at a first end (13) axially remote from a second end (14) into which the pin-like appendage (11) is inserted.

7. Spectacles according to Claim 6 in which the hole (12a) in the bush-like element (12) has, in the second end (14), a diameter larger than that of the pin-like appendage (11) so that the appendage (11) is inserted in the bush-like element (12) with relative clearance, at least for a portion of the hole (12a).

8. Spectacles according to Claim 6 or Claim 7 in which the diameter of the hole in the bush-like element (12) decreases from the second end (14) towards the first end (13).

9. Spectacles according to one or more of the preceding claims in which  
5 the hole (12a) in the bush-like element (12) comprises a second portion (18) extending as a continuation of the first portion (17) and coaxial therewith.

10. Spectacles according to Claim 9 in which the second portion (18) is cylindrical.

11. Spectacles according to Claim 9 in which the second portion (18) is  
10 conical with a taper different from that of the first portion (17).

12. Spectacles according to one or more of the preceding claims in which pressure coupling means are provided between the pin-like appendage (11) and the bush-like element (12).

13. Spectacles according to one or more of Claims 1 to 12 in which snap-  
15 coupling means are provided between the pin-like appendage (11) and the bush-like element (12).

14. Spectacles according to Claim 12 in which the coupling means comprise one or more projections (16) on the pin-like appendage (11).

15. Spectacles according to Claim 12 in which the projections (16) have an  
20 annular or spiral shape on the external lateral surface of the appendage (11).

16. Spectacles according to one or more of the preceding claims in which the bush-like element (12) comprises operating means for the disengagement of the pin-like appendage (11) from the hole (12a) in the bush-like element (12).

17. Spectacles according to Claim 16 in which the operating means  
25 comprise a polygonal profile formed in at least part of the lateral surface of the bush-like element (12).

18. Spectacles according to Claim 17 in which the profile is formed on an enlarged head (19) extending from the bush-like element (12) in the region of the first end (13).

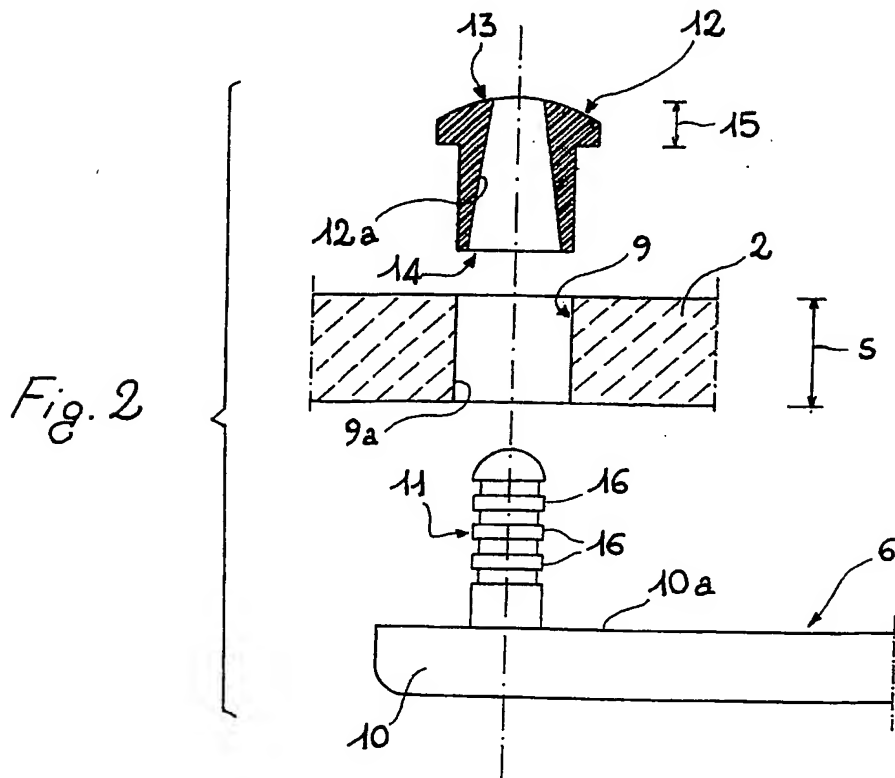
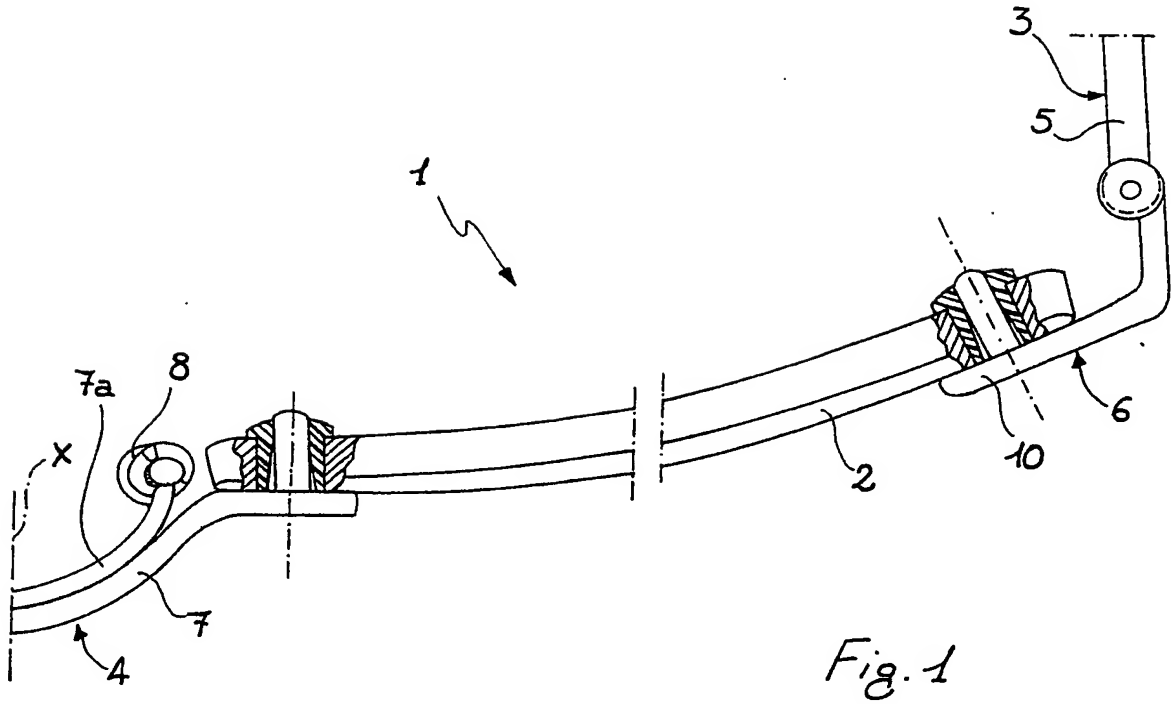
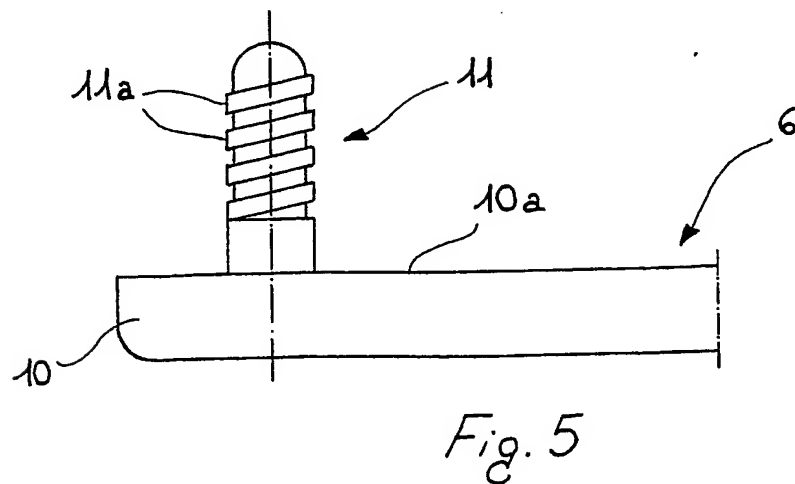
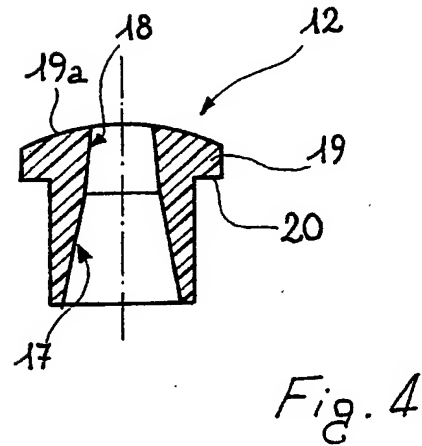
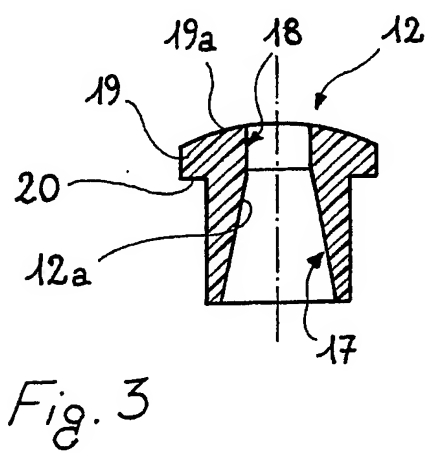
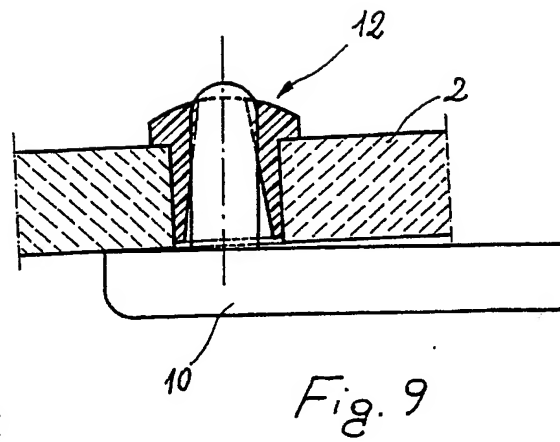
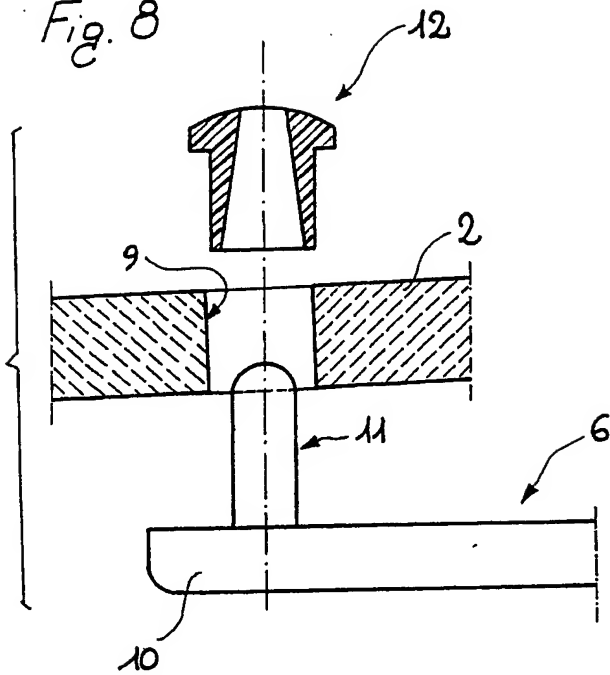
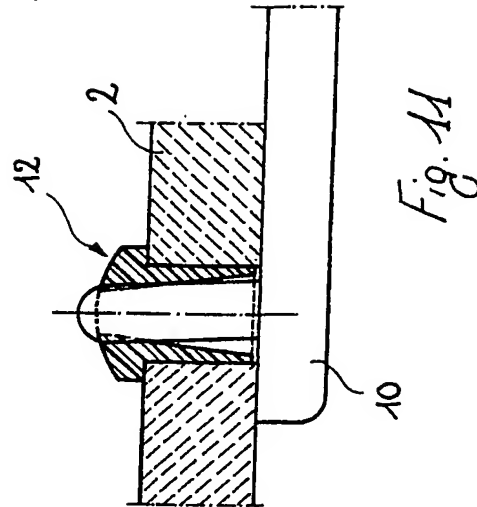
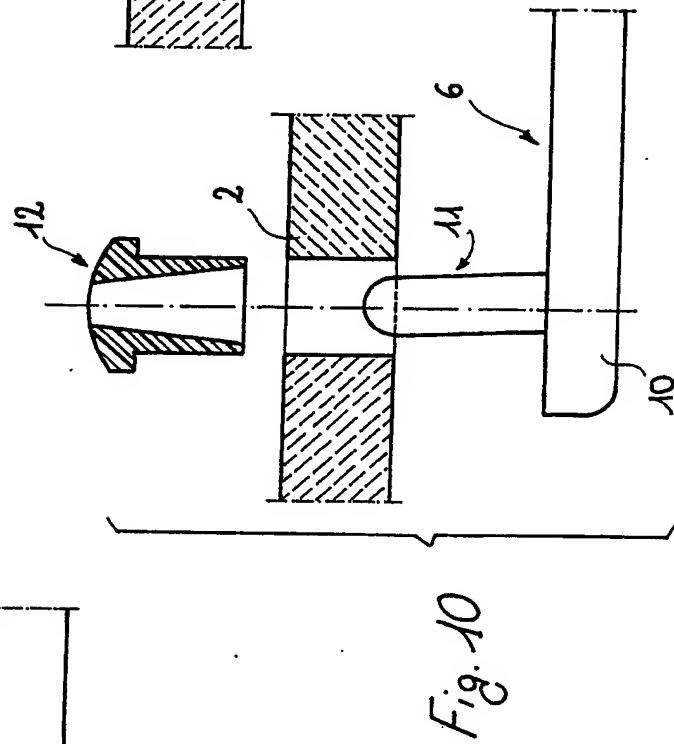
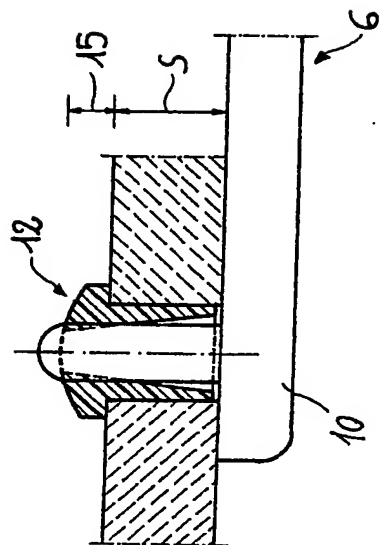
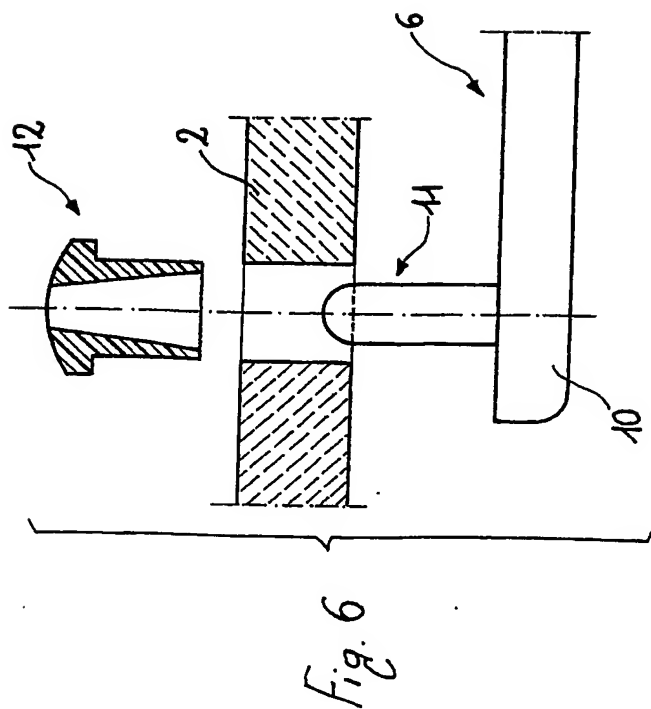


Fig. 8





A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 G02C1/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 G02C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)  
EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 024 445 A (CONNER BRIAN N ET AL) 15 February 2000 (2000-02-15) column 5, line 29 -column 64	1,2, 12-15
A	WO 98 19203 A (BUCK KIM ;HANSEN FLEMMING BO (DK); PRO DESIGN INTERNATIONAL A S (D) 7 May 1998 (1998-05-07) page 12, line 16 -page 13, line 23; figure 6	1-3, 12-18
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☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

## \* Special categories of cited documents :

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Date of the actual completion of the international search

11 September 2002

Date of mailing of the international search report

18/09/2002

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